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# Investigation to determine whether the Minneosta Multiphasic Personality Inventory can be used to identify the automobile accident repeater

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# AN INVESTIGATION TO DETERMINE WHETHER THE MINNESOTA MULTIPHASIC PERSONALITY INVENTORY CAN BE USED TO IDENTIFY THE AUTOMOBILE ACCIDENT REPEATER

by

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# CHAPTER I

## THE PROBLEM AND DEFINITIONS OF THE TERMS

Highway safety is one of the most important social problems in the United States. It is being dealt with at all levels; from the Federal Government's financing of co-ordinated research to local safety campaigns. Nevertheless, automobile accidents continue to occur at an alarming rate. Since the advent of the first automobiles in 1895 there have been over a million traffic fatalities in the United States. There are, on the average, 35,000 people fatally injured and approximately 60,000 who are permanently crippled annually.

The research to improve this situation has fallen into three categories:

1. The physical situation
    a. highway design
    b. automobile design
    c. traffic control
2. The average driver
    a. his psychophysical aptitude and limitations
    b. his psychological aspects
3. The abnormal driver
    a. the physically abnormal
    b. the chronic violator
    c. the accident repeater

Investigations have been made in each of the subdivisions. The work with accident repeaters has been indicative, but hardly conclusive. The indications have been that emotional factors and personality adjustment are significant in accident experience.

## I. THE PROBLEM

### Statement of the problem

The purpose of this study was to determine whether a personality inventory would identify those individuals most likely to become accident repeaters.

The problem was to locate a group of persons who were involved in automobile accidents more than the normal, and a control group of accident-free drivers who could be equated with the accident-repeater group in the principal characteristics which seem to influence the number of accidents, and administer a personality test to the two groups.

### Importance of the study

It has been found that the person who is an accident repeater during one period of time is likely to continue this higher-than-normal accident rate during other periods.[1] Accident statistics also have indicated that a small group of drivers have a disproportionately large number of accidents.[2] If the campaign to lower accident rates is to be

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[1]United States Congress. The Accident Prone Driver; Motor Vehicle Traffic Conditions in the United States, House Document No. 462, Part VI, Washington D. C. Government Printing Office, 1938.

[2]Ibid.

fully effective some method must be discovered to find the accident repeater and to either help him or take him off the roads.

## II. DEFINITION OF TERMS

Accident — An automobile accident is an involvement of one or more vehicles with at least $100.00 in property damages and/or personal injury. In the present study all accidents referred to are automobile accidents.

Accident Repeater — An accident repeater is an automobile driver who has had three or more accidents within the last four-year period. This definition is based upon the assumption that a person must have three or more accidents in a given length of time to be considered an accident repeater. This assumption, coupled with an examination of the Missoula, Montana Township Police Department accident files for the years 1948 through 1953 revealed that a four-year period: 1950, 1951, 1952, and 1953 was the shortest period of time that would yield an adequate number of accident repeaters for the purpose of this study.

Accident Prone — This is a concept that appears frequently in the literature, therefore, a definition is supplied:

> "An accident-prone individual is one who possesses a combination of personal characteristics leading to unsafe operation of a motor vehicle."[1]

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[1] D. J. Van Lennep. "Psychological Factors in Driving," Traffic Quarterly, 6:483-498, October, 1952.

# CHAPTER II

# REVIEW OF THE LITERATURE

## CHAPTER II

## REVIEW OF THE LITERATURE

A review of the literature for this study includes an analysis of the Minnesota Multiphasic Personality Inventory and an investigation of the previous work done concerning the accident repeater, especially the automobile accident repeater.

### A Review of the Literature Concerning the Minnesota Multiphasic Personality Inventory

A number of studies have been carried out with the M. M. P. I. to determine its sensitivity in distinguishing the normal from the abnormal. Among these is a study by Clark working with army AWOL recidivists. In it he stated:

> An insignificant relationship between M. M. P. I. sub-scale scores and recidivism was found. An analysis provided a tentative recidivist scale as yet unvalidated. Pd and Ma appear to be the most valid in selecting recidivists.[1]

A study reported in 1949 by Franklin Fry was concerned with a comparison of the personality traits of college students and of state prison inmates. In his conclusion he states:

> The male prisoners exceeded the male college students in the scales hypochondriasis, depression, psychopathic deviate, paranoia, schizophrenia, and hypomania at the five per cent level of confidence.[2]

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[1] J. H. Clark. "Application of the M. M. P. I. in Differentiating AWOL Recidivists from Non-recidivists." Journal of Applied Psychology, 26:229-234, July, 1945.

[2] Franklin Fry. "A Study of the Personality Traits of College Students and of State Prison Inmates as Measured by the M. M. P. I." Journal of Psychology, 28:439-449, October, 1949.

Such a clear-cut difference was not found in a comparative study of Monachesi who concluded:

> In a study of M. M. P. I. scales in regard to delinquents and non-delinquents, only four scales -- depression, hysteria, psychopathic deviate, and paranoia -- produced differences in mean scores which may not be due to chance.[1]

## An Investigation of the Previous Work Done Concerning the Accident Repeater

The studies concerned with the accident repeater have fallen primarily into three categories, the statistical, the psychophysical, and the psychological. Each of these will be investigated to determine their contributions to the accident repeater problem.

### 1. The Statistical Approach

As early as World War I personnel accidents were being tabulated to determine if all accidents could be accounted for on a chance basis alone. As Greenwood and Woods stated:

> The statistical evidence indicated that a large portion of the accidents may occur to a small number of persons having personal susceptibility to accidents.[2]

Some twenty years later the U. S. Government published a report with substantially the same point of view. It said, in summation, that

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[1] E. O. Monachesi. "Personality Characteristics and Socio-Economic Status of Delinquents and Non-delinquents," Journal of Criminal Law and Criminology, XL:570-583, January-February, 1950.

[2] M. Greenwood and H. M. Woods. "The Incidence of Industrial Accidents upon Individuals with Special Reference to Multiple Accidents," Industrial Fatigue Research Board, No. 4, London: H. M. Stationery Office, 1919.

the accident-repeater driver can be credited with about forty per cent of the fatal accidents, about thirty-five per cent of the personal injuries due to automobile accidents and thirty-seven per cent of the property damage incurred by accidents, yet these percentages were accumulated by only four per cent of the driving population.[1]

Farmer, in a study in 1939, attempted a study to predict the "accident-prone" driver. He said:

> The drivers who had accidents in their initial year will have a tendency to have more accidents in the following years.[2]

But the whole concept of accident proneness as a predictor of accident occurrence was challenged by Cobb, when he stated that accident occurrence would follow Poisson's Law, and thus several accidents by the same individual could be accounted for by chance factors.[3]

An article by Jurgensen, however, presents statistics which indicate that chance distribution may not be able to account for the accident repeater.

Jurgensen stated that:

> 49 per cent of the people had 94 per cent of the accidents
> 11 per cent of the people had 50 per cent of the accidents,
> 3 per cent of the people had 24 per cent of the accidents[4]

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[1]United States Congress. Op. cit.

[2]E. Farmer and E. G. Chambers. Report of the Industrial Health Research Board, No. 54:111-155, 1939.

[3]P. W. Cobb. "The Limit of Usefulness of Accident Rate as a Measure of Accident Proneness," Journal of Applied Psychology, 24:536-545, 1938.

[4]C. E. Jurgensen. "How Much Do We Know About Accident Causes," National Safety News, 52:526-527, 1945.

2. The Psychophysical Approach

Even with some doubt cast upon the accident-prone concept, a number of studies were undertaken to establish the possible causality.

In 1938 DeSilva reported a study which indicated that inexperience in automobile operation was not a determining factor.[1]

Sellings, in a summary of progress stated that two of the factors responsible for accident-proneness are physical inadequacy and psychophysical inadequacy.[2]

DeSilva, in exploring some of the physical inadequacies reported:

> Men excel women in tests of resistance to glare, co-ordination, manipulation and strength, while women have fewer accidents than men.[3]

This may indicate that at least certain physical inadequacies cannot account for the accident repeater.

Ghiselli and Brown also reported some research in regard to the physical inadequacies that could account for the accident-prone driver.

They stated:

> Intelligence or amount of schooling does not have a high correlation with driving success.[4]

In a later study, Ghiselli and Brown reported that:

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[1]H. R. DeSilva. "Age and Highway Accidents," The Scientific Monthly, 47:536-545, 1938.

[2]Lowell S. Selling. "Psychiatry in Industrial Accidents," Advanced Management, 10:70-75, 1945.

[3]H. R. DeSilva. Why We Have Automobile Accidents, New York: John Wiley and Sons, 1942, pp. 394.

[4]E. E. Ghiselli and C. W. Brown. "Factors Related to the Proficiency of Motor Coach Operators," Journal of Applied Psychology, 31:477-490, 1947.

> By constructing a battery of paper and pencil tests, using such tests as dotting and tapping, and interest tests, we were able to predict the accident-prone individual. The validity coefficient for the entire battery was .59.[1]

Scott indicated in a near parallel study that there was a high degree of relationship between performance test ratings and past safety violations.[2]

In summarizing the findings of the studies, the Eno Foundation stated:

> No significant differences were found in the following: (a) systolic and diastolic blood pressure, (b) recreational interests, (c) intelligence and education, and (d) economic status.[3]

Similarly, Alexander said:

> Most research studies show little relationship between factors of reaction time, visual skills, judgment, steadiness, glare, and the accident rate.[4]

The psychophysical approach has been rather inconclusive.

3. The Psychological Approach

A number of investigations have suggested that the personality characteristics of the individual may be the primary factor responsible for the accident rate.

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[1]E. E. Ghiselli and C. W. Brown. "The Prediction of Accidents of Taxicab Drivers," Journal of Applied Psychology, 33:540-546, 1949.

[2]John F. Scott, Ernest S. Primoff and S. Rauruch. "Merit System Selection of Chauffers and Truck Drivers," American Psychologist, 5:357, 1950.

[3]Eno Foundation for Highway Traffic Control. Personal Characteristics of Traffic Accident Repeaters, Saugatuck, Conn.: 1949, pp. 165.

[4]Carlton Alexander. Psychological Tests for Drivers at the McLean Trucking Company, Saugatuck, Conn.: Eno Foundation for Highway Traffic Control, 1953.

Dunbar, in discussing the medical aspects of accidents, stated that accident repeaters present personality profiles different from the normal.[1]

Kraft and Forbes stated that:

> Of seventy-six personal and medical items studied, reliable relationships were found for about one out of three of them. None of these relationships were significant at the ten per cent level of confidence.[2]

Selling, in a psychiatric study of traffic offenders concluded that emotional defects contribute to accident-proneness.[3]

Johnson and later Wong and still later Le Shan said that personal data could be used to detect the accident-prone driver.[4, 5, 6]

Harris constructed a psychological test, using some specific biographical data and items of the type found in the Bernreuter Personality Inventory, the Multiple-Choice Rorschach, and the Rosenzweig Picture-Frustration Test. But no significant differences were found between a group of accident-free workers and a group of accident-repeating workers.[7]

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[1] Flanders Dunbar. "Medical Aspects of Accidents and Mistakes in the Industrial Army and the Armed Forces," War Medicine, 4:161-175, 1943.

[2] M. A. Kraft and T. W. Forbes. "Evaluating the Influence of Personal Characteristics on the Traffic Operators," Proceedings of the 24th Annual Meeting of the Highway Research Board of the National Research Council, 276-291, 1944.

[3] L. S. Selling. "Psychiatric Findings in the Cases of 500 Traffic Offenders and Accident-Prone Drivers," American Journal of Psychiatry, 97:68-79, 1940.

[4] H. W. Johnson. "The Detection and Treatment of Accident-Prone Drivers," Psychological Bulletin, 43:487-532, 1946.

[5] W. A. Wong and G. E. Hobbs. "Personal Factors in Industrial Accidents," Industrial Medicine, 18:291-296, 1949.

[6] L. L. LeShan. "Dynamics in Accident-Prone Behavior," Psychiatry, 15:73-80, 1952.

[7] F. J. Harris. "Can Personality Tests Identify Accident-Prone Employees," Personnel Psychology, 29:455-459, 1950.

Bixler, in an analysis, stated that fifty per cent of all accidents are caused by personality factors, such as recklessness, nervousness, or excitability.[1]

Rush concluded that safe driving depends upon correct interpretation, rather than fast reactions, and interpretation is affected by the personality of the individual.[2]

Tillman, in two studies, reported that stability[3] and specific personality adjustment[4] could be used to indicate the accident repeater. The stability factor, Kremple concluded, was the underlying factor in accident causation.[5]

Moorad stated that:

> There are five types of neuroses or psychoneuroses which contribute in directing the individual toward accident-proneness. They are: hypomania, depression, paranoia, malingering, and psychopathic.[6]

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[1]H. S. Bixler. "Emotional Factors in Safety," Personnel Journal, 25:9-14, 1945.

[2]L. F. Rush and G. L. Wilson. "The Rush-Wilson Safe Driver Selection System," American Psychologist, 4:279, 1949.

[3]W. A. Tillman and G. E. Hobbs. "The Accident-Prone Automobile Driver: A Study of the Psychiatric and Social Background," American Journal of Psychiatry, 10:321-31, 1949.

[4]W. A. Tillman. The Psychiatric and Social Approach to the Detection of Accident-Prone Drivers, University of Western Ontario, London: 1948.

[5]R. J. Kremple. A Study of Application Blank Items to Discover Those Differentiating Accident-Free from Accident-Prone Drivers, Western Reserve University, 1951.

[6]P. J. Moorad. "Human Factors in Accident Liability with Special Reference to Accident Repeaters in Industry, Industrial Medicine, 16:494-498, 1947.

Hirschberg concluded that there does not seem to be a direct relationship between the degree of the personality disturbance that was seen clinically and the accident potential of the individual.[1]

The findings of the Eno Foundation[2] seem to support the belief that a valid and reliable psychological test can be used to advantage in identifying individuals whose personalities in some way handicap them in operating a motor vehicle. Yet certainly there is some truth in the remark of Lauer when he said:

> It is a fact that we don't know of any test that will predict the accident-prone driver.[3]

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[1]J. S. Hirschberg, et al. "A Study of Miners in Relation to the Accident Problem," American Journal of Orthopsychiatry, 20:552-557, 1950.

[2]Eno Foundation for Highway Control. The Motor Vehicle Driver: His Nature and Improvement, Saugatuck, Conn.: Eno Foundation for Highway Control, 1949, pp. 165.

[3]Aluhh Lauer, "Facts and Fancies Regarding Driver Testing Procedure," Journal of Applied Psychology, 21:173-184, April, 1937.

# CHAPTER III

## METHOD OF PROCEDURE

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The Minnesota Multiphasic Personality Inventory was the primary instrument of this study; therefore, the first part of this chapter will be an explanation of the testing technique of the M.M.P.I. used in this study.

The other tool utilized in this study was a Personal Data Sheet.[1] Its development and application will be detailed in the second part of the chapter.

The final parts of this chapter evolved into two phases. The first phase was the measures employed in locating a group of accident repeaters, controlling the variables considered to exert some influence upon factors in the study, and collecting the test data on this group.

The second phase was the measures employed in locating a group of accident-free drivers, controlling the influencing variables and collecting the test data on this group.

### The Minnesota Multiphasic Personality Inventory Testing Technique

The Minnesota Multiphasic Personality Inventory[2] is a self-report test, consisting of five hundred sixty-six statements. There are two

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[1] See Appendix I.

[2] Starke P. Hathaway and J. Charnley McKinley. The Minnesota Multiphasic Personality Inventory, Minneapolis: University of Minnesota Press, 1948.

forms; the individual form and the group form.

The group form consists of a printed booklet with statements such as:

> Someone has it in for me. I daydream very little. Sometimes I enjoy hurting persons I love.

With the booklet is an answer sheet, numbered to correspond with the statements in the booklet. On the answer sheet the statements are marked true or false as applied to the individual. If the statement does not apply to the individual the answer sheet is left unmarked for that statement, this being equivalent to the "Cannot Say" category of the individual form.

The scoring keys were devised by administering the test to a group of psychiatric patients and a group of normal adults. The answers given more often by a psychiatric patient than a normal were included in the key representing the psychiatric category of that individual.

Thus, the keys built up were: hypochondriasis, depression, hysteria, psychopathic deviate, masculinity, paranoia, psychasthenia, schizophrenia, hypomania, and sociability.

Each of the keys can be defined by describing the psychiatric category. Hypochondriasis (Hs) is characterized by preoccupation with a supposed defect of an organ which is functioning normally. Depression (D) is a state of dejection, lowered initiative, and possibly self-depreciating delusions. Hysteria (Hy) is a psychogenic disorder, the symptoms of which may be anesthesia and paralysis. The psychopathic deviate's (Pd) chief symptom is an emotional instability coupled with a lack of social or moral judgment. Masculinity (Mf) is a key which

indicates whether the individual identifies with the same or the opposite sex. Paranoia (Pa) is characterized by systematized delusions of persecution and/or grandeur. Psychasthenia (Pt) is denoted by recurrent obsessions. Schizophrenia (Sc) is disorganization of the individual's personality combined with private fantasy. Hypomania (Ma) is "generally, an elated, but unstable mood, psychomotor excitement and flight of ideas."[1] Sociability (Si) can be characterized as an indication of the individual's ability and desire to adjust to the social situation.

Certain errors are unavoidable in the self-report test. These errors are taken account of and to some degree adjusted for by employing four other scores. A brief description of each of these scores follows:

The question (?) score is the number of times the subject's response is "Cannot Say." The lie (L) score is based on the fact that certain responses are unlikely and indicate lying or self-deception. The false (F) score indicates either carelessness in sorting or answering or misunderstanding. The (K) score is an adjustment score for five of the scales: hypochondriasis, psychopathic deviate, psychasthenia, schizophrenia and hypomania. It is used to adjust for the subject's being either overly critical or overly lenient with himself.

The instructions for the group form are given on the front of the booklet.

They are:

> This inventory consists of numbered statements. Read each statement and decide whether it is <u>true as applied to you or</u>

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[1] <u>Ibid.</u>

false as applied to you.

You are to mark your answers on the answer sheet. If a statement is TRUE or MOSTLY TRUE, as applied to you, blacken the area labeled "T" for True. If a statement is FALSE or NOT USUALLY TRUE as applied to you, blacken the area labeled "F" for False. If a statement does not apply to you or if it is something that you don't know about, make no mark on the answer sheet.

Remember to give YOUR OWN opinion of yourself. Do not leave any blank spaces if you can avoid it.

In marking your answers on the answer sheet, be sure that the number of the statement agrees with the number on the answer sheet.[1]

These instructions were amplified by the examiner. This was done to acquaint the testee with the form and the extent of the test in order that he would be willing to co-operate in the study and so that he would be prepared for the personal nature of some of the questions.

Both of these points were considered necessary, since the subjects as a whole were naive in regard to psychological tests.

These added instructions were:

"I am making a study of the personality of this area. To do this I first randomly select a number of people of each age group from Missoula County. Now I am contacting them to see if they would be willing to help in finding out that this area is 'better' than others. Your name was drawn. I would certainly appreciate it if you would take this personality test for me.

"This is the personality test. It is made up of statements which you answer true or false as applies to you. This is the answer sheet for the test and this is a short personal data sheet that I'd like you

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[1]Hathaway and McKinley, op. cit.

to fill out along with the personality test.

"Please do the test on your own and if any of the questions seem to be too personal feel free to leave them out."

In certain cases resistance was encountered at this point. When such was the case, the instructions were continued in this manner:

"The questions are like this. 'I like mechanics magazines. I have a good appetite. I wake up fresh and rested most mornings.' Do you see? And then you answer each statement true or false as it applies to you."

In all but the completely negative reactions the individual was willing at this point to co-operate.

## The Personal Data Sheet

The investigation of previous work revealed three factors which seemed to have some influence upon the driver accident record. These factors were the age of the individual, the amount he drives annually and the sex of the person. In order to obtain this information without informing the testee as to the exact nature of the study, it was decided to construct a short personal data sheet which included this information. It was decided to keep the questionnaire as short as possible and still to some extent mask the important questions. In that regard, ten questions were finally devised. They were:

1. Name
2. Age
3. Sex
4. Age driver's license was first obtained
5. Marital status

6. Number of children
7. Employment
8. Estimated distance driven annually
9. Number of accidents while driving in the last four years
10. Sports or hobbies

From these it was possible to maintain a tabulation on the three factors desired and it was also possible to maintain a check on the accident records of the individuals in both groups to prevent a sampling error.

Within the two groups, the accident-repeater group and the accident-free group, the Personal Data Sheet was used differently. On the accident repeaters, the questionnaire was used only as a tabulator, a quantitative device, while on the accident-free group the questionnaire was used as a selective device. This differentiation of application will be discussed further in later sections of this chapter.

## The Accident-Repeater Group

The initial step in approaching the experimental group entailed extensive research into the records of the Missoula, Montana Municipal Police Department accident records. These records revealed seventy-seven persons who had had three or more accidents in the last four years. These records also revealed the age of each of the individuals, their occupations, and their addresses. When a comparison of the accident-repeater list was made with the Missoula City Directory for 1953, it disclosed that twenty-eight of the individuals on the list were no longer in this area and thus not available for this study. The number of persons left on the list was thus forty-nine. It was decided to extend the list by

going through the files of two of the local insurance adjustors. From this research twenty-two names were obtained of accident repeaters as listed in the insurance files. The ages, occupations, and addresses were also obtained for this list. Upon comparing this list with the Missoula City Directory for 1953, three persons were discarded from this list as being unavailable. Therefore, a total of nineteen remained in this list and a total of sixty-eight persons remained on the combined list.

The two lists were comparable in regard to the accident criterion. In order to appear on police department accident records, an accident had to involve $100.00 property damage or personal injury, while the insurance adjustors' files included both the monetary involvement and the fact of personal injury, so that accidents which met the criterion were sought selectively.

A superficial analysis of the sixty-eight accident repeaters in regard to occupation-driving indicated that fourteen of the individuals were in occupations requiring considerable driving. Since this fact could be the precipitating factor in regard to the number of accidents, it was decided to drop them from the list. This left a group of fifty-four accident repeaters.

The testing of the accident repeaters ceased when the thirtieth test was completed, this being the number previously established as adequate for this study.

## The Accident-Free Group

The Missoula City Directory was utilized and sixty individuals were randomly selected. Each of these persons was contacted. Of the sixty, it

was possible to locate forty-six and thirty-six of these agreed to contribute to the study. Of the thirty-six, three decided not to take the inventory after "looking at the questions." This left a total of thirty-three who completed the test.

A preliminary examination was made of the personal data sheets to determine if the estimated mileage driven and the age distribution of the accident-free group compared favorably with the estimated mileage and the age distribution of the accident repeaters. The estimated mileage driven for the accident repeaters seemed to be slightly higher than the estimated mileage driven of the accident-free group. Therefore, it was decided to select a number of accident-free individuals who drove a long distance annually.

The age distribution for the accident-free group seemed to be devoid of anyone in the age group twenty-five to thirty-five, so it was decided to locate a service organization in Missoula, Montana which would have a predominance of members in this age range. It was also thought that since it is this age range which does more than an average amount of driving, the estimated distance driven annually might possibly become more nearly equated.

The Missoula Junior Chamber of Commerce was contacted. At one of their meetings the study was explained and the members were asked to volunteer to take the test. At that time twenty of the members said they would be willing, so the tests were distributed. Only twelve of these twenty completed the test, however. Thus, the total accident-free group at this time was forty-eight.

In order to equate the age and mileage for the two groups, a

distribution of ages for the accident repeaters was obtained. This distribution was followed by a distribution of mileage estimates.

The forty-eight accident-free personal data sheets were utilized and by trial-and-error, thirty accident-free data sheets were selected which yielded age and estimated mileage distributions for the accident-free group which were comparable to the age and mileage distributions of the accident repeaters. The Personality Inventories of these individuals were used to comprise the test data for the accident-free group. The only control exercised on the sex factor was to include two women in each of the groups.

With the test data of the two groups at hand, the scores were calculated and the results compared. These calculations and results will be discussed in detail in the next chapter.

# CHAPTER IV

# PRESENTATION AND ANALYSIS OF DATA

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The results of this study will be presented and interpreted in this chapter. The study was divided primarily into two investigations. The first investigation was a determination of how well the two groups in the study were matched in regard to age and estimated mileage driven. The second investigation involved the probability of identifying the accident repeater from the scores of the Minnesota Multiphasic Personality Inventory.

### Data on the Group Matching

It was noted previously that three factors were considered to be of first-order importance in influencing the accident rate of drivers. These factors were age, mileage, and sex. The two groups, the accident repeaters and the accident-free drivers, were matched for age, mileage, and sex. The results of the matching for age are given on Table I.

A comparison of the ages of the two groups showed a difference between the means of +1 year. The coefficient of correlation[1] for the two groups was .98, while the $t^2$ ratio was .84.

The difference between the means is negligible, while the size of the correlation coefficient indicates a high degree of correspondence between the groups.

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[1]Henry E. Garrett. Statistics In Psychology And Education, Toronto: Longmans, Green and Co., 1937, pp. 271.

[2]Allen Louis Edwards. Experimental Design in Psychological Research, New York: Rinehart, 1950.

TABLE I

STATISTICS OF THE MATCHING OF THE TWO GROUPS IN REGARD TO AGE

| SUBJECT | REPEATERS X | ACCIDENT-FREE Y |
|---|---|---|
| 1. | 16 | 17 |
| 2. | 17 | 17 |
| 3. | 17 | 18 |
| 4. | 17 | 18 |
| 5. | 18 | 18 |
| 6. | 18 | 19 |
| 7. | 18 | 19 |
| 8. | 19 | 19 |
| 9. | 21 | 21 |
| 10. | 22 | 21 |
| 11. | 23 | 21 |
| 12. | 23 | 20 |
| 13. | 25 | 25 |
| 14. | 26 | 28 |
| 15. | 28 | 29 |
| 16. | 28 | 27 |
| 17. | 29 | 27 |
| 18. | 30 | 31 |
| 19. | 31 | 31 |
| 20. | 32 | 37 |
| 21. | 39 | 37 |
| 22. | 41 | 39 |
| 23. | 41 | 39 |
| 24. | 47 | 40 |
| 25. | 48 | 40 |
| 26. | 50 | 55 |
| 27. | 53 | 50 |
| 28. | 60 | 59 |
| 29. | 67 | 59 |
| 30. | 71 | 64 |
| | $M_x = 33$ | $M_y = 32$ |
| | $\sigma_x = 5$ | $\sigma_y = 4$ |
| | $r = .93$ | $\sigma_{diff} = 1.19$ $\quad t = .84$ |

$$r = \frac{\Sigma xy}{\sqrt{\Sigma x^2 \cdot \Sigma y^2}} \qquad \sigma_{diff} = \sqrt{\sigma_{M_x}^2 + \sigma_{M_y}^2} \qquad t = \frac{M_x - M_y}{\sigma_{diff}}$$

A t ratio of 2.756 would have been necessary for the difference between the means to be significant at the one per cent level of confidence and a t ratio of 2.045 would have been necessary for the difference between the means to be significant at the five per cent level of confidence. It should be noted that since the number of individuals in the groups, and hence the degrees of freedom in this study is constant, the size of the critical ratios at both the one per cent and five per cent level of confidence will remain the same throughout.

Since the t ratio for the age factor is .84, the difference between the means is not significant.

A comparison of the mileage driven annually for the two groups is given in Table II. It shows that the difference between the means is 2,000 miles. The t ratio is .89, which indicates that the difference between the means is not significant. The correlation coefficient is .36. This would indicate that there is some degree of correspondence between the groups in regard to the mileage driven annually.

The third factor mentioned was the sex distribution in the groups. Both groups were equated concerning this factor. There were two women and twenty-eight men in each group.

## Data on the Identification of the Accident Repeater

The fundamental purpose of this study was to determine whether the Minnesota Multiphasic Personality Inventory would differentiate between the accident-free individuals and the accident repeaters. In order to probe for a difference, it was necessary to compare the two matched groups' scores on the ten clinical scales of the M.M.P.I.

TABLE II

STATISTICS OF THE COMPARISON OF THE TWO GROUPS IN REGARD TO ESTIMATED ANNUAL MILEAGE

| SUBJECT | REPEATERS X | ACCIDENT-FREE Y |
|---|---|---|
| 1. | 2* | 2 |
| 2. | 2 | 5 |
| 3. | 4 | 9 |
| 4. | 11 | 3 |
| 5. | 9 | 5 |
| 6. | 10 | 24 |
| 7. | 15 | 12 |
| 8. | 4 | 5 |
| 9. | 5 | 1 |
| 10. | 15 | 5 |
| 11. | 20 | 13 |
| 12. | 50 | 20 |
| 13. | 10 | 5 |
| 14. | 15 | 13 |
| 15. | 5 | 11 |
| 16. | 20 | 10 |
| 17. | 7 | 15 |
| 18. | 20 | 30 |
| 19. | 20 | 25 |
| 20. | 3 | 2 |
| 21. | 30 | 10 |
| 22. | 15 | 2 |
| 23. | 30 | 12 |
| 24. | 10 | 11 |
| 25. | 5 | 9 |
| 26. | 25 | 20 |
| 27. | 8 | 10 |
| 28. | 1 | 8 |
| 29. | 5 | 15 |
| 30. | 2 | 20 |
| | $M_x = 13$<br>$\sigma_x = 10$ | $M_y = 11$<br>$\sigma_y = 7$ |
| | $r = .36$ $\sigma diff = 2.26$ | $t = .89$ |

$$r = \frac{\Sigma xy}{\sqrt{\Sigma x^2 \cdot \Sigma y^2}} \qquad \sigma diff = \sqrt{\sigma_{M_x}^2 + \sigma_{M_y}^2} \qquad t = \frac{M_x - M_y}{\sigma diff}$$

* All the integers except those given for r and t represent units in 1,000's of miles.

The data resulting from these comparisons are presented and analyzed in the order used by the authors of the inventory in evaluating their test; namely, Hypochondriasis, Depression, Hysteria, Psychopathic Deviate, Masculinity, Paranoia, Psychasthenia, Schizophrenia, Hypomania, and Sociability Index.[1]

In Table III are the results of the comparison of the Hypochondriasis scale, for the two groups. The mean for the accident repeaters is 52; the mean for the accident-free group is 48. The difference between the means is +4.

The t ratio for the two groups is 1.91. This statistic indicates that there is not a significant difference between the means of the two groups.

The use of the t ratio or critical ratio as it is sometimes called is actually a statistical test of the null hypothesis,[2] which states that no difference exists between the means of the general population. In order to reject the null hypothesis it is necessary to statistically find a difference which indicates that a difference of this size would be found by chance in no more than one case in one hundred. This would be called the one per cent level of confidence in rejecting the null hypothesis. If the difference indicates that such a difference would be found by chance in no more than five cases in one hundred, it would be called the five per cent level of confidence.

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[1]Hathaway and McKinley, op. cit.

[2]Edwards, op. cit.

TABLE III

STATISTICS OF THE COMPARISON BETWEEN THE TWO GROUPS OF SCORES ON THE HYPOCHONDRIASIS SCALE

| SUBJECT | REPEATERS X | ACCIDENT-FREE Y |
|---|---|---|
| 1. | 57 | 53 |
| 2. | 39 | 49 |
| 3. | 56 | 53 |
| 4. | 50 | 57 |
| 5. | 59 | 39 |
| 6. | 54 | 41 |
| 7. | 64 | 54 |
| 8. | 45 | 43 |
| 9. | 41 | 47 |
| 10. | 48 | 44 |
| 11. | 39 | 52 |
| 12. | 41 | 55 |
| 13. | 77 | 47 |
| 14. | 41 | 53 |
| 15. | 54 | 67 |
| 16. | 44 | 45 |
| 17. | 54 | 38 |
| 18. | 64 | 41 |
| 19. | 59 | 54 |
| 20. | 41 | 45 |
| 21. | 48 | 43 |
| 22. | 62 | 51 |
| 23. | 45 | 44 |
| 24. | 60 | 53 |
| 25. | 48 | 45 |
| 26. | 59 | 57 |
| 27. | 41 | 46 |
| 28. | 56 | 39 |
| 29. | 45 | 49 |
| 30. | 51 | 41 |
| | $M_x = 52$ | $M_y = 48$ |
| | $\sigma_x = 9.0$ | $\sigma_y = 6.6$ |
| | $\sigma_{M_x} = 1.67$ | $\sigma_{M_y} = 1.22$ |

$\sigma_{diff} = 2.1$

$t = 1.91$

$\sigma_{diff} = \sqrt{\sigma_{M_x}^2 + \sigma_{M_y}^2}$

$t = \dfrac{M_x - M_y}{\sigma_{diff}}$

TABLE IV

STATISTICS OF THE COMPARISON BETWEEN THE TWO GROUPS OF SCORES ON THE DEPRESSIVE SCALE

| SUBJECT | REPEATERS X | ACCIDENT-FREE Y |
|---|---|---|
| 1. | 60 | 51 |
| 2. | 36 | 48 |
| 3. | 74 | 46 |
| 4. | 51 | 43 |
| 5. | 82 | 39 |
| 6. | 58 | 51 |
| 7. | 56 | 44 |
| 8. | 53 | 28 |
| 9. | 60 | 44 |
| 10. | 44 | 48 |
| 11. | 44 | 60 |
| 12. | 42 | 48 |
| 13. | 75 | 56 |
| 14. | 51 | 51 |
| 15. | 49 | 49 |
| 16. | 44 | 47 |
| 17. | 46 | 42 |
| 18. | 64 | 41 |
| 19. | 62 | 36 |
| 20. | 40 | 41 |
| 21. | 51 | 41 |
| 22. | 54 | 49 |
| 23. | 64 | 48 |
| 24. | 65 | 30 |
| 25. | 41 | 39 |
| 26. | 58 | 60 |
| 27. | 47 | 43 |
| 28. | 54 | 69 |
| 29. | 53 | 47 |
| 30. | 42 | 51 |
| | $M_x = 54$ | $M_y = 46$ |
| | $\sigma_x = 10.7$ | $\sigma_y = 8.3$ |
| | $\sigma_{M_x} = 1.99$ | $\sigma_{M_y} = 1.54$ |

$\sigma diff = 2.5$

$t = 3.20$

$\sigma diff = \sqrt{\sigma_{M_x}^2 + \sigma_{M_y}^2}$

$t = \frac{M_x - M_y}{\sigma diff}$

TABLE V

STATISTICS OF THE COMPARISON BETWEEN THE TWO GROUPS OF SCORES ON THE HYSTERIA SCALE

| SUBJECT | REPEATERS X | ACCIDENT-FREE Y |
|---|---|---|
| 1. | 62 | 56 |
| 2. | 38 | 62 |
| 3. | 58 | 64 |
| 4. | 52 | 62 |
| 5. | 58 | 54 |
| 6. | 58 | 47 |
| 7. | 55 | 49 |
| 8. | 47 | 51 |
| 9. | 51 | 51 |
| 10. | 45 | 53 |
| 11. | 44 | 63 |
| 12. | 44 | 59 |
| 13. | 71 | 51 |
| 14. | 56 | 63 |
| 15. | 57 | 58 |
| 16. | 49 | 39 |
| 17. | 54 | 59 |
| 18. | 52 | 57 |
| 19. | 61 | 47 |
| 20. | 52 | 54 |
| 21. | 56 | 61 |
| 22. | 62 | 50 |
| 23. | 57 | 56 |
| 24. | 61 | 51 |
| 25. | 56 | 56 |
| 26. | 58 | 69 |
| 27. | 47 | 54 |
| 28. | 53 | 52 |
| 29. | 52 | 55 |
| 30. | 44 | 62 |
| | $M_x = 54$ | $M_y = 55$ |
| | $\sigma_x = 6.8$ | $\sigma_y = 6.2$ |
| | $\sigma_{M_x} = 1.26$ | $\sigma_{M_y} = 1.15$ |

$\sigma_{diff} = 1.70$

$t = +.59$

$\sigma_{diff} = \sqrt{\sigma_{M_x}^2 + \sigma_{M_y}^2}$

$t = \frac{M_x - M_y}{\sigma_{diff}}$

TABLE VI

STATISTICS OF THE COMPARISON BETWEEN THE TWO GROUPS OF SCORES ON THE PSYCHOPATHIC DEVIATE SCALE

| SUBJECT | REPEATERS X | ACCIDENT-FREE Y |
|---|---|---|
| 1. | 67 | 63 |
| 2. | 62 | 46 |
| 3. | 41 | 61 |
| 4. | 50 | 58 |
| 5. | 50 | 66 |
| 6. | 60 | 53 |
| 7. | 60 | 53 |
| 8. | 53 | 52 |
| 9. | 50 | 57 |
| 10. | 49 | 41 |
| 11. | 67 | 64 |
| 12. | 53 | 58 |
| 13. | 67 | 62 |
| 14. | 47 | 46 |
| 15. | 56 | 53 |
| 16. | 33 | 52 |
| 17. | 85 | 61 |
| 18. | 67 | 54 |
| 19. | 60 | 70 |
| 20. | 48 | 53 |
| 21. | 60 | 59 |
| 22. | 47 | 52 |
| 23. | 67 | 49 |
| 24. | 60 | 64 |
| 25. | 53 | 53 |
| 26. | 56 | 53 |
| 27. | 62 | 51 |
| 28. | 50 | 57 |
| 29. | 60 | 48 |
| 30. | 53 | 51 |
| | $M_x = 56$ | $M_y = 55$ |
| | $\sigma_x = 9.7$ | $\sigma_y = 6.5$ |
| | $\sigma_{M_x} = 1.80$ | $\sigma_{M_y} = 1.20$ |

$\sigma_{diff} = 2.16$

$t = .464$

$\sigma_{diff} = \sqrt{\sigma_{M_x}^2 + \sigma_{M_y}^2}$

$t = \frac{M_x - M_y}{\sigma_{diff}}$

TABLE VII

STATISTICS OF THE COMPARISON BETWEEN THE TWO GROUPS OF SCORES ON THE MASCULINITY SCALE

| SUBJECT | REPEATERS X | ACCIDENT-FREE Y |
|---|---|---|
| 1. | 53 | 61 |
| 2. | 57 | 53 |
| 3. | 52 | 42 |
| 4. | 53 | 46 |
| 5. | 51 | 61 |
| 6. | 57 | 53 |
| 7. | 45 | 59 |
| 8. | 51 | 58 |
| 9. | 48 | 39 |
| 10. | 43 | 56 |
| 11. | 53 | 39 |
| 12. | 72 | 53 |
| 13. | 55 | 45 |
| 14. | 53 | 66 |
| 15. | 48 | 49 |
| 16. | 43 | 45 |
| 17. | 43 | 58 |
| 18. | 65 | 52 |
| 19. | 63 | 49 |
| 20. | 51 | 47 |
| 21. | 72 | 48 |
| 22. | 53 | 74 |
| 23. | 58 | 50 |
| 24. | 48 | 51 |
| 25. | 54 | 48 |
| 26. | 55 | 41 |
| 27. | 45 | 51 |
| 28. | 50 | 57 |
| 29. | 49 | 61 |
| 30. | 66 | 45 |
| | $M_x = 54$ | $M_y = 52$ |
| | $\sigma_x = 7.6$ | $\sigma_y = 8.0$ |
| | $\sigma_{M_x} = 1.41$ | $\sigma_{M_y} = 1.48$ |

$\sigma_{diff} = 2.04$

$t = .98$

$\sigma_{diff} = \sqrt{\sigma_{M_x}^2 + \sigma_{M_y}^2}$

$t = \dfrac{M_x - M_y}{\sigma_{diff}}$

TABLE VIII

STATISTICS OF THE COMPARISON BETWEEN THE TWO GROUPS OF SCORES ON THE PARANOIA SCALE

| SUBJECT | REPEATERS X | ACCIDENT-FREE Y |
|---|---|---|
| 1. | 62 | 53 |
| 2. | 47 | 44 |
| 3. | 62 | 56 |
| 4. | 65 | 59 |
| 5. | 59 | 42 |
| 6. | 50 | 52 |
| 7. | 56 | 45 |
| 8. | 43 | 47 |
| 9. | 68 | 56 |
| 10. | 50 | 57 |
| 11. | 47 | 44 |
| 12. | 68 | 47 |
| 13. | 57 | 45 |
| 14. | 53 | 51 |
| 15. | 48 | 63 |
| 16. | 45 | 43 |
| 17. | 47 | 72 |
| 18. | 70 | 48 |
| 19. | 59 | 44 |
| 20. | 48 | 53 |
| 21. | 62 | 44 |
| 22. | 59 | 77 |
| 23. | 43 | 43 |
| 24. | 54 | 47 |
| 25. | 59 | 41 |
| 26. | 50 | 47 |
| 27. | 68 | 50 |
| 28. | 49 | 43 |
| 29. | 60 | 44 |
| 30. | 51 | 38 |
| | $M_x = 55$ | $M_y = 50$ |
| | $\sigma_x = 7.9$ | $\sigma_y = 8.8$ |
| | $\sigma_{M_x} = 1.46$ | $\sigma_{M_y} = 1.63$ |

$\sigma_{diff} = 2.19$

$t = 2.28$

$\sigma_{diff} = \sqrt{\sigma_{M_x}^2 + \sigma_{M_y}^2}$

$t = \frac{M_x - M_y}{\sigma_{diff}}$

for the five per cent level of confidence. The results for this scale, therefore, shows a significant difference between the means of the two groups at the 5 per cent level.

Psychasthenia is the scale reported in Table IX. The mean for the accident repeaters on this scale is 54, while the mean for the accident-free group on this scale is 46. This is a mean difference of +8. The t ratio for the two groups on this scale is 3.09; therefore, the difference between the means is significant at the one per cent level of confidence.

Table X reports the results for the comparison of the groups on the Schizophrenic scale. The mean for the accident-free group is 49. The mean for the accident repeaters is 53. The difference between these means is +4. The t value is 1.53. This indicates that the difference between the means is not significant.

Hypomania is the next scale in the M.M.P.I. Its results for this study are in Table XI. The means are 57 and 57 for the accident repeaters and the accident-free drivers, respectively. The difference between these means is 0 and the t ratio is 0.

The final clinical scale of the M.M.P.I. used in this study was the Sociability Index. The results for this scale are reported in Table XII. The mean for the accident repeaters is 51, while the mean for the accident-free group is 46. This gives a difference of +5. The t ratio for the comparison is 1.99. This indicates that the difference between the means is not significant.

This chapter has presented statistics indicating that the two groups

TABLE IX

STATISTICS OF THE COMPARISON BETWEEN THE TWO GROUPS OF SCORES ON THE PSYCHASTHENIC SCALE

| SUBJECT | REPEATERS X | ACCIDENT-FREE Y |
|---|---|---|
| 1. | 56 | 48 |
| 2. | 46 | 50 |
| 3. | 60 | 31 |
| 4. | 65 | 50 |
| 5. | 50 | 42 |
| 6. | 64 | 46 |
| 7. | 43 | 50 |
| 8. | 48 | 42 |
| 9. | 47 | 42 |
| 10. | 34 | 46 |
| 11. | 40 | 55 |
| 12. | 50 | 41 |
| 13. | 85 | 66 |
| 14. | 52 | 50 |
| 15. | 49 | 39 |
| 16. | 32 | 42 |
| 17. | 55 | 49 |
| 18. | 77 | 44 |
| 19. | 56 | 50 |
| 20. | 48 | 50 |
| 21. | 62 | 33 |
| 22. | 48 | 43 |
| 23. | 54 | 38 |
| 24. | 48 | 41 |
| 25. | 55 | 58 |
| 26. | 65 | 52 |
| 27. | 72 | 62 |
| 28. | 48 | 40 |
| 29. | 61 | 36 |
| 30. | 57 | 50 |
| | $M_x = 54$ | $M_y = 46$ |
| | $\sigma_x = 11.4$ | $\sigma_y = 8.1$ |
| | $\sigma_{M_x} = 2.11$ | $\sigma_{M_y} = 1.50$ |

$$\sigma_{diff} = 2.59$$

$$t = 3.09$$

$$\sigma_{diff} = \sqrt{\sigma_{M_x}^2 + \sigma_{M_y}^2}$$

$$t = \frac{M_x - M_y}{\sigma_{diff}}$$

TABLE X

STATISTICS OF THE COMPARISON BETWEEN THE TWO GROUPS OF SCORES ON THE SCHIZOPHRENIC SCALE

| SUBJECT | REPEATERS X | ACCIDENT-FREE Y |
|---|---|---|
| 1. | 56 | 53 |
| 2. | 40 | 46 |
| 3. | 51 | 54 |
| 4. | 67 | 50 |
| 5. | 44 | 55 |
| 6. | 53 | 40 |
| 7. | 61 | 59 |
| 8. | 46 | 42 |
| 9. | 52 | 48 |
| 10. | 31 | 38 |
| 11. | 38 | 51 |
| 12. | 53 | 52 |
| 13. | 84 | 71 |
| 14. | 44 | 42 |
| 15. | 50 | 38 |
| 16. | 42 | 43 |
| 17. | 66 | 65 |
| 18. | 65 | 32 |
| 19. | 61 | 54 |
| 20. | 51 | 45 |
| 21. | 52 | 37 |
| 22. | 42 | 48 |
| 23. | 56 | 55 |
| 24. | 65 | 39 |
| 25. | 57 | 43 |
| 26. | 40 | 46 |
| 27. | 52 | 65 |
| 28. | 46 | 50 |
| 29. | 67 | 53 |
| 30. | 56 | 42 |
| | $M_x = 53$ | $M_y = 49$ |
| | $\sigma_x = 10.9$ | $\sigma_y = 8.89$ |
| | $\sigma M_x = 2.02$ | $\sigma M_y = 1.65$ |

$\sigma diff = 2.61$

$t = 1.53$

$\sigma diff = \sqrt{\sigma M_x^2 + \sigma M_y^2}$

$t = \frac{M_x - M_y}{\sigma diff}$

TABLE XI

STATISTICS OF THE COMPARISON BETWEEN THE TWO GROUPS OF SCORES ON THE HYPOMANIA SCALE

| SUBJECT | REPEATER X | ACCIDENT-FREE Y |
|---|---|---|
| 1. | 63 | 43 |
| 2. | 78 | 50 |
| 3. | 58 | 61 |
| 4. | 75 | 70 |
| 5. | 50 | 78 |
| 6. | 52 | 45 |
| 7. | 55 | 64 |
| 8. | 45 | 70 |
| 9. | 61 | 56 |
| 10. | 50 | 48 |
| 11. | 57 | 43 |
| 12. | 65 | 54 |
| 13. | 65 | 61 |
| 14. | 48 | 50 |
| 15. | 55 | 58 |
| 16. | 47 | 63 |
| 17. | 68 | 54 |
| 18. | 48 | 37 |
| 19. | 60 | 63 |
| 20. | 59 | 72 |
| 21. | 48 | 54 |
| 22. | 65 | 66 |
| 23. | 55 | 72 |
| 24. | 50 | 51 |
| 25. | 63 | 56 |
| 26. | 48 | 47 |
| 27. | 57 | 61 |
| 28. | 59 | 53 |
| 29. | 52 | 64 |
| 30. | 65 | 47 |
| | $M_x = 57$ | $M_y = 57$ |
| | $\sigma_x = 8.2$ | $\sigma_y = 9.9$ |
| | $\sigma_{M_x} = 1.52$ | $\sigma_{M_y} = 1.83$ |

$\sigma_{diff} = 2.38$

$t = 0$

$\sigma_{diff} = \sqrt{\sigma_{M_x}^2 + \sigma_{M_y}^2}$

$t = \dfrac{M_x - M_y}{\sigma_{diff}}$

TABLE XII

STATISTICS OF THE COMPARISON BETWEEN THE TWO GROUPS OF SCORES ON THE SOCIABILITY INDEX SCALE

| SUBJECT | REPEATERS X | ACCIDENT-FREE Y |
|---|---|---|
| 1. | 38 | 43 |
| 2. | 46 | 56 |
| 3. | 66 | 37 |
| 4. | 49 | 34 |
| 5. | 65 | 42 |
| 6. | 38 | 45 |
| 7. | 62 | 37 |
| 8. | 42 | 47 |
| 9. | 51 | 42 |
| 10. | 65 | 66 |
| 11. | 40 | 62 |
| 12. | 46 | 38 |
| 13. | 56 | 32 |
| 14. | 44 | 64 |
| 15. | 39 | 50 |
| 16. | 46 | 35 |
| 17. | 50 | 46 |
| 18. | 51 | 37 |
| 19. | 55 | 38 |
| 20. | 42 | 34 |
| 21. | 54 | 58 |
| 22. | 42 | 62 |
| 23. | 54 | 43 |
| 24. | 54 | 51 |
| 25. | 63 | 56 |
| 26. | 51 | 34 |
| 27. | 44 | 36 |
| 28. | 49 | 67 |
| 29. | 53 | 51 |
| 30. | 59 | 54 |
| | $M_x = 51$ | $M_y = 45$ |
| | $\sigma_x = 8.2$ | $\sigma_y = 10.8$ |
| | $\sigma_{M_x} = 1.52$ | $\sigma_{M_y} = 2.00$ |

$\sigma_{diff} = 2.51$

$t = 1.99$

$\sigma_{diff} = \sqrt{\sigma_{M_x}^2 + \sigma_{M_y}^2}$

$t = \dfrac{M_x - M_y}{\sigma_{diff}}$

of drivers employed in this study were matched in regard to age, mileage, and sex. It has also presented evidence that certain scales of the Minnesota Multiphasic Personality Inventory differentiated the accident-repeater driver from the accident-free driver. Presented in Table XIII is a statistical summation of the test scores.

TABLE XIII

STATISTICAL EVALUATION OF M.M.P.I. SCORES

| | $M_x$ | $M_y$ | x | y | r | diff | t |
|---|---|---|---|---|---|---|---|
| Age | 33 | 32 | 5 | 4 | .98 | 1.19 | .84 |
| Mileage | 13 | 11 | 10 | 7 | .36 | 2.26 | .89 |
| Hs | 52 | 48 | 9.0 | 6.6 | | 2.1 | 1.91 |
| D | 54 | 46 | 10.7 | 8.3 | | 2.5 | 3.20* |
| Hy | 54 | 55 | 6.8 | 6.2 | | 1.70 | .59 |
| Pd | 56 | 55 | 9.7 | 6.5 | | 2.16 | .464 |
| Mf | 54 | 52 | 7.6 | 8.0 | | 2.04 | .98 |
| Pa | 55 | 50 | 7.9 | 8.8 | | 2.19 | 2.28** |
| Pt | 54 | 46 | 11.4 | 8.1 | | 2.59 | 3.09* |
| Sc | 53 | 49 | 10.9 | 8.9 | | 2.61 | 1.53 |
| Ma | 57 | 57 | 8.2 | 9.9 | | 2.38 | 0.00 |
| Si | 51 | 46 | 8.2 | 10.8 | | 2.51 | 1.99 |

* SIGNIFICANT AT THE 1% LEVEL OF CONFIDENCE
** SIGNIFICANT AT THE 5% LEVEL OF CONFIDENCE

# CHAPTER V

# SUMMARY AND CONCLUSIONS

# CHAPTER V

# SUMMARY AND CONCLUSIONS

## I. SUMMARY

It has been suggested a number of times in the last twenty years that it is the total person, not just the individual's physical reactions, who is the automobile driver. If this is the case, it is to be suspected that the personality of the individual will dictate to some extent the manner in which he operates his vehicle. This being so, it would follow that a personality maladjustment may be an underlying cause of automobile accident repetition.

The hypothesis of this study was: "A personality inventory can be used to identify the individuals who are likely to become accident repeaters."

This hypothesis presented a threefold problem to be solved:

(1) The selection of a personality inventory. The Minnesota Multiphasic Personality Inventory was selected primarily because of its capacity to reveal certain personality maladjustments, any one of which might hinder the individual's operation of an automobile.

(2) The location of a group of accident repeaters and a group of accident-free drivers, and the matching of these groups in the factors which were thought to be influencing; age, mileage, and sex. The accident repeaters were located by recourse to the accident records of the Missoula Municipal Police Department. The accident-free group was located by taking a random sample from the Missoula City Directory in

addition to a selective sampling from the Junior Chamber of Commerce.

These groups were matched by picking from the total number of accident-free drivers a group that most closely compared with the accident repeaters in the factors considered. There were thirty individuals in each group.

(3) The administration of the Minnesota Multiphasic Personality Inventory, its scoring and finally the evaluation of the scale scores to determine what differences existed between the scores of the accident repeaters and the scores of the accident-free drivers.

The results of the scoring and statistical evaluation are shown on Table XIII. As can be seen in that Table, three of the scales, Depression, Psychasthenia, and Paranoia, show significant results. Depression and Psychasthenia are significant at the one per cent level of confidence, and Paranoia is significant at the five per cent level of confidence. The other clinical scales of the Minnesota Multiphasic Personality Inventory show no significant difference between the means of the two groups.

## II. CONCLUSIONS

The results of this study should first be somewhat qualified by the fact that the matching of the two groups was only partially successful. The matching for age was satisfactory, but the matching for mileage fell short. While it is difficult to see how this variable could account for the results found in this study, the fact remains that this possibility should not be ignored.

The significant findings of this study were the mean differences

existing in the scores on three of the scales for the two groups. As has been stated, these scales were Depression, Psychasthenia, and Paranoia.

These findings suggest two possible conclusions. First, that the hypothesis of this study is to some extent substantiated, and the possibility exists that a personality inventory can be used to reveal the accident repeater. Secondly, that the multiple accidents experienced by the repeater group may have affected the personality structures of these individuals.

This second possibility suggests a longitudinal study to determine whether automobile accidents bring about personality changes of the pattern found in this study.

# BIBLIOGRAPHY

## BIBLIOGRAPHY


Alexander, Carlton. Psychological Tests for Drivers at the McLean Trucking Company. Saugatuck, Conn.: Eno Foundation for Highway Traffic Control, 1953.

Bixler, H. R. "Emotional Factors in Safety," Personnel Journal, 25:9-14, 1945.

Clark, J. H. "Application of the Minnesota Multiphasic Personality Inventory in Differentiating AWOL Recidivists from Non-recidivists," Journal of Psychology, 26:229-34, July, 1948.

Cobb, P. W. "The Limit of Usefulness of Accident Rate as a Measure of Accident Proneness," Journal of Applied Psychology, 24:154-159, 1940.

DeSilva, H. R. "Age and Highway Accidents," The Scientific Monthly, 47:536-545, 1938.

DeSilva, H. R. Why We Have Automobile Accidents, New York: John Wiley and Sons, 1942, pp. 394.

Dunbar, Flanders. "Medical Aspects of Accidents and Mistakes in the Industrial Army and the Armed Forces," War Medicine, 4:161-175, 1943.

Edwards, Allen Louis. Experimental Design in Psychological Research, New York: Rinehart, 1950.

Eno Foundation for Highway Traffic Control. Personal Characteristics of Traffic Accident Repeaters, Saugatuck, Conn.: Eno Foundation for Highway Traffic Control, 1948, pp. 64.

Eno Foundation for Highway Traffic Control. The Motor Vehicle Driver: His Nature and Improvement, Saugatuck, Conn.: Eno Foundation for Highway Control, 1949, pp. 165.

Farmers, E. and Chambers, E. G. Report of the Industrial Health Research Board, No. 84:111-155, 1939, London: H. M. Stationery Office.

Fry, Franklin D. "A Study of the Personality Traits of College Students and of State Prison Inmates as Measured by the M. M. P. I.," Journal of Psychology, 28:439-449, October, 1949.

Garrett, Henry E. Statistics in Psychology and Education, Toronto: Longmans, Green and Co., 1937.

Ghiselli, E. E. and Brown, C. W. "Factors Related to the Proficiency of Motor Coach Operators," Journal of Applied Psychology, 31:477-490, 1947.

Ghiselli, E. E. and Brown, C. W. "Accident Proneness Among Street Car Motormen and Motor Coach Operators," Journal of Applied Psychology, 32:20-23, 1948.

Ghiselli, E. E. and Brown, C. W. "The Prediction of Accidents of Taxicab Drivers," Journal of Applied Psychology, 33:540-546, 1949.

Greenwood, M. and Woods, H. M. "The Incidence of Industrial Accidents upon Individuals with Special Reference to Multiple Accidents," Industrial Fatigue Research Board, No. 4, London: H. M. Stationery Office, 1919.

Harris, Frank J. "Can Personality Tests Identify Accident-Prone Employees," Personnel Psychology, 29:455-459, 1950.

Hathaway, Starke R. and McKinley, J. Charnley. The Minnesota Multiphasic Personality Inventory, Minneapolis: University of Minnesota Press, 1942.

Hirschberg, J. S.; Rogers, Lawrence; Stubblefield, R. L.; Thaler, Margaret; Princi, Frank and Coleman, Jules. "A Study of Miners in Relation to the Accident Problem," American Journal of Orthopsychiatry, 20:552-557, 1950.

Johnson, H. M. "The Detection and Treatment of Accident-Prone Drivers," Psychological Bulletin, 43:489-532, 1946.

Jurgensen, C. E. "How Much Do We Know About Accident Causes," National Safety News, 52:526-527, 1945.

Kraft, M. A. and Forbes, T. W. "Evaluating the Influence of Personal Characteristics on the Traffic Operators," Proceedings of the Twenty-Fourth Annual Meeting of the Highway Research Board of the National Research Council, 278-291, 1944.

Kremple, Robert J. A Study of Application Blank Items to Discover Those Differentiating Accident-Free from Accident-Prone Drivers, Western Reserve University, Cleveland: unpublished, 1951.

Lauer, Aluhh R. "Facts and Fancies Regarding Driver Testing Procedures," Journal of Applied Psychology, 21:173-184, April, 1937.

LeShan, Lawrence L. "Dynamics in Accident-Prone Behavior," Psychiatry, 15:73-80, 1952.

Monachesi, Elio O. "Personality Characteristics and Socio-Economic Status of Delinquents and Non-Delinquents," Journal of Criminal Law and Criminology, XL:570-583, January-February, 1950.

Morrad, Philip J. "Human Factors in Accident Liability with Special Reference to Accident Repeaters in Industry," Industrial Medicine, 16:494-498, 1947.

National Research Council, Committee on Highway Safety Research. The Field of Highway Safety Research, National Research Council, Washington, D. C., Revised, August, 1952.

National Safety Council, Accident Facts, National Safety Council, Chicago, 1951.

Ronis, Leonard. A Study of Characteristics Differentiating Bus Drivers Who Have Accidents from Those Who Do Not Have Accidents, Western Reserve University, Cleveland, unpublished, 1951.

Ruch, L. F. and Wilson, Clark L. "The Ruch-Wilson Safe Driver Selection System," American Psychologist, 4:279-280, 1949.

Scott, John P.; Primoff, Ernest S. and Rauruch, Samuel. "Merit System Selection of Chauffers and Truck Drivers," American Psychologist, 5:357, 1950.

Selling, Lowell S. "Psychiatric Findings in the Cases of 500 Traffic Offenders and Accident-Prone Drivers," American Journal of Psychiatry, 97:68-79, 1940.

Selling, Lowell S. "Psychiatry in Industrial Accidents," Advanced Management, 10:70-75, 1945.

Tillmann, William A. The Psychiatric and Social Approach to the Detection of Accident-Prone Drivers, University of Western Ontario, London, 1948.

Tillmann, William A. and Hobbs, G. E. "The Accident-Prone Automobile Driver: A Study of the Psychiatric and Social Background," American Journal of Psychiatry, 106:321-331, November, 1949.

Toops, Herbert A. and Haven, S. Edson. "Viewing the Traffic Problem," Journal of Applied Psychology, 21:185-189, 1937.

United States Congress. The Accident-Prone Driver; Motor Vehicle Traffic Conditions in the United States, House Document, No. 462, Part VI, Washington, D. C. Government Printing Office, 1938.

Van Lenneip, D. J. "Psychological Factors in Driving," Traffic Quarterly, 6:483-498, October, 1952.

White House Conference on Highway Safety. Edited Proceedings of the Committee of Business Delegates, Washington, D. C., February 17-18, 1954.

Wong, W. A. and Hobbs, G. E. "Personal Factors in Industrial Accidents," Industrial Medicine, 18:291-294, 1949.

# APPENDIX I

FORM FOR PERSONAL DATA SHEET

Please fill in and return before starting the test proper.

1. Name in full _____
(last) (first) (middle)
2. Age _____
3. Sex _____
4. At what age did you get your first driver's license?

_____

5. Marital status (check one)

_____Married _____Single _____Divorced _____Widow(er)

6. Number of children (if any) _____
7. Employment (what exactly do you do?) _____

_____

8. Estimated distance driven annually? _____
9. Number of accidents while driving in the last four years? _____
10. Sports or hobbies (if any) _____

_____

# APPENDIX II

TABLE XIV

M.M.P.I. SCORES OF THE ACCIDENT-REPEATER GROUP

| | K | F | L | Hs | D | Hy | Pd | Mf | Pa | Pt | Sc | Ma | Si |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | 73 | 55 | 63 | 57 | 60 | 62 | 67 | 53 | 62 | 56 | 56 | 63 | 38 |
| 2. | 48 | 58 | 60 | 39 | 36 | 38 | 62 | 57 | 47 | 46 | 40 | 78 | 46 |
| 3. | 53 | 53 | 56 | 56 | 74 | 58 | 41 | 52 | 62 | 60 | 51 | 58 | 66 |
| 4. | 48 | 57 | 53 | 50 | 51 | 52 | 50 | 53 | 65 | 65 | 67 | 75 | 49 |
| 5. | 34 | 57 | 56 | 59 | 82 | 58 | 50 | 51 | 59 | 50 | 44 | 50 | 65 |
| 6. | 65 | 50 | 60 | 54 | 58 | 58 | 60 | 57 | 50 | 64 | 53 | 52 | 38 |
| 7. | 57 | 48 | 72 | 64 | 56 | 55 | 60 | 45 | 60 | 43 | 61 | 55 | 62 |
| 8. | 62 | 44 | 50 | 45 | 53 | 47 | 53 | 51 | 43 | 48 | 46 | 45 | 42 |
| 9. | 48 | 62 | 70 | 41 | 60 | 51 | 50 | 48 | 68 | 47 | 52 | 61 | 51 |
| 10. | 36 | 50 | 46 | 48 | 44 | 45 | 49 | 43 | 50 | 34 | 31 | 50 | 65 |
| 11. | 49 | 50 | 50 | 39 | 44 | 44 | 67 | 53 | 47 | 40 | 38 | 57 | 40 |
| 12. | 55 | 47 | 52 | 41 | 42 | 44 | 53 | 72 | 68 | 50 | 53 | 65 | 46 |
| 13. | 43 | 71 | 70 | 77 | 75 | 71 | 67 | 55 | 57 | 85 | 84 | 65 | 56 |
| 14. | 53 | 50 | 56 | 44 | 51 | 56 | 47 | 53 | 53 | 52 | 44 | 48 | 44 |
| 15. | 64 | 44 | 60 | 54 | 49 | 57 | 56 | 48 | 48 | 49 | 50 | 55 | 39 |
| 16. | 48 | 52 | 60 | 49 | 44 | 49 | 33 | 43 | 45 | 32 | 42 | 47 | 46 |
| 17. | 55 | 70 | 46 | 54 | 46 | 54 | 85 | 43 | 47 | 55 | 66 | 68 | 50 |
| 18. | 48 | 60 | 63 | 64 | 64 | 52 | 67 | 65 | 70 | 77 | 65 | 48 | 61 |
| 19. | 49 | 58 | 60 | 59 | 62 | 61 | 60 | 63 | 59 | 56 | 61 | 60 | 55 |
| 20. | 51 | 46 | 60 | 41 | 40 | 52 | 48 | 51 | 48 | 48 | 51 | 59 | 42 |
| 21. | 55 | 53 | 53 | 48 | 51 | 56 | 60 | 72 | 62 | 62 | 52 | 48 | 54 |
| 22. | 44 | 53 | 56 | 62 | 54 | 62 | 47 | 53 | 59 | 48 | 42 | 65 | 42 |
| 23. | 44 | 71 | 60 | 45 | 64 | 57 | 67 | 58 | 43 | 54 | 56 | 55 | 54 |
| 24. | 55 | 60 | 63 | 60 | 65 | 61 | 60 | 48 | 54 | 48 | 65 | 50 | 54 |
| 25. | 59 | 58 | 70 | 48 | 41 | 56 | 53 | 54 | 59 | 55 | 57 | 63 | 63 |
| 26. | 60 | 50 | 56 | 54 | 58 | 58 | 56 | 55 | 50 | 65 | 40 | 48 | 51 |
| 27. | 49 | 48 | 60 | 41 | 47 | 47 | 62 | 45 | 68 | 77 | 52 | 57 | 44 |
| 28. | 53 | 54 | 46 | 56 | 54 | 53 | 50 | 50 | 49 | 48 | 46 | 59 | 49 |
| 29. | 46 | 46 | 60 | 45 | 53 | 52 | 60 | 49 | 60 | 61 | 67 | 52 | 53 |
| 30. | 61 | 43 | 53 | 51 | 42 | 44 | 53 | 66 | 51 | 57 | 56 | 65 | 59 |
| M | 52 | 54 | 58 | 52 | 54 | 54 | 56 | 54 | 55 | 54 | 53 | 57 | 51 |

TABLE XV

M.M.P.I. SCORES OF THE ACCIDENT-FREE GROUP

| | K | F | L | Hs | D | Hy | Pd | Mf | Pa | Pt | So | Ma | Si |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | 68 | 53 | 56 | 53 | 51 | 56 | 63 | 61 | 53 | 48 | 53 | 43 | 43 |
| 2. | 57 | 50 | 60 | 49 | 48 | 62 | 46 | 53 | 44 | 50 | 46 | 50 | 56 |
| 3. | 56 | 47 | 56 | 53 | 46 | 64 | 61 | 42 | 56 | 31 | 54 | 61 | 37 |
| 4. | 62 | 46 | 60 | 57 | 43 | 62 | 58 | 46 | 59 | 50 | 50 | 70 | 34 |
| 5. | 49 | 55 | 56 | 39 | 39 | 54 | 66 | 61 | 42 | 42 | 55 | 78 | 42 |
| 6. | 46 | 52 | 63 | 41 | 51 | 47 | 53 | 53 | 52 | 46 | 40 | 45 | 45 |
| 7. | 56 | 55 | 44 | 54 | 44 | 49 | 53 | 59 | 45 | 50 | 59 | 64 | 37 |
| 8. | 44 | 53 | 46 | 43 | 28 | 51 | 52 | 58 | 47 | 42 | 42 | 70 | 47 |
| 9. | 59 | 50 | 60 | 47 | 44 | 51 | 57 | 39 | 56 | 42 | 48 | 56 | 42 |
| 10. | 51 | 46 | 43 | 44 | 48 | 53 | 41 | 56 | 57 | 46 | 38 | 48 | 36 |
| 11. | 65 | 55 | 73 | 52 | 60 | 63 | 64 | 39 | 44 | 55 | 51 | 43 | 62 |
| 12. | 58 | 52 | 48 | 55 | 48 | 59 | 58 | 53 | 47 | 41 | 52 | 54 | 38 |
| 13. | 59 | 48 | 63 | 47 | 56 | 51 | 62 | 45 | 45 | 66 | 71 | 61 | 32 |
| 14. | 46 | 53 | 71 | 53 | 51 | 63 | 46 | 66 | 51 | 50 | 42 | 50 | 64 |
| 15. | 55 | 47 | 58 | 67 | 49 | 58 | 53 | 49 | 63 | 39 | 38 | 58 | 50 |
| 16. | 64 | 49 | 59 | 45 | 47 | 39 | 52 | 45 | 43 | 42 | 43 | 63 | 35 |
| 17. | 63 | 53 | 47 | 38 | 42 | 59 | 61 | 58 | 72 | 49 | 65 | 54 | 46 |
| 18. | 53 | 51 | 62 | 41 | 41 | 57 | 54 | 52 | 48 | 44 | 32 | 37 | 37 |
| 19. | 48 | 55 | 60 | 54 | 36 | 47 | 70 | 49 | 44 | 50 | 54 | 63 | 38 |
| 20. | 61 | 49 | 55 | 45 | 41 | 54 | 53 | 47 | 53 | 50 | 45 | 72 | 34 |
| 21. | 53 | 55 | 47 | 43 | 41 | 61 | 59 | 48 | 44 | 33 | 37 | 54 | 58 |
| 22. | 57 | 50 | 61 | 51 | 49 | 50 | 52 | 74 | 77 | 43 | 48 | 66 | 62 |
| 23. | 68 | 53 | 54 | 44 | 48 | 56 | 49 | 50 | 43 | 38 | 55 | 72 | 43 |
| 24. | 59 | 49 | 63 | 53 | 30 | 51 | 64 | 51 | 47 | 41 | 39 | 51 | 51 |
| 25. | 51 | 50 | 44 | 45 | 39 | 56 | 53 | 48 | 41 | 58 | 43 | 56 | 56 |
| 26. | 53 | 49 | 57 | 57 | 60 | 69 | 53 | 41 | 47 | 52 | 46 | 47 | 34 |
| 27. | 44 | 55 | 46 | 46 | 43 | 54 | 51 | 51 | 50 | 62 | 65 | 61 | 36 |
| 28. | 54 | 46 | 58 | 39 | 69 | 52 | 57 | 57 | 43 | 40 | 50 | 53 | 67 |
| 29. | 56 | 48 | 64 | 49 | 47 | 55 | 48 | 61 | 44 | 36 | 53 | 64 | 51 |
| 30. | 66 | 54 | 47 | 41 | 51 | 62 | 51 | 45 | 38 | 50 | 42 | 47 | 34 |
| M | 56 | 51 | 56 | 48 | 46 | 55 | 55 | 52 | 50 | 46 | 49 | 57 | 44 |